



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/781,783

02/20/2004

Hiroki Ooi

1075.1251

4549

21171 7590 12/19/2008
STAAS & HALSEY LLP
SUITE 700
1201 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

EXAMINER

KIM, DAVID S

ART UNIT

PAPER NUMBER

2613

MAIL DATE

DELIVERY MODE

12/19/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Art Unit: 2613

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. **Claims 1, 4-7, and 10-13** are rejected under 35 U.S.C. 103(a) as being unpatentable over Tager et al. (U.S. Patent Application Publication No. US 2004/0208608 A1, hereinafter "Tager") in view of Kelly (U.S. Patent No. 6,931,176 B2), Ramaswami et al. (*Optical Networks: A Practical Perspective*, 2nd ed., hereinafter "Ramaswami"), and Tanaka et al. (U.S. Patent No. 6,433,923 B2, hereinafter "Tanaka").

Regarding claim 1, Tager discloses:

A wavelength division multiplexing optical repeating transmission method (Fig. 4) for repeating transmission of a wavelength multiplexed optical signal along an optical transmission line interconnecting a terminal apparatus for transmission (115) and a terminal apparatus for reception (116) and having a plurality of divisional repeating intervals into which the optical transmission line is divided by a plurality of repeating apparatuses (117), comprising steps executed by each of said repeating apparatuses disposed at end points of the divisional repeating intervals, the steps including:

a first dispersion compensation step (e.g., note the dispersion compensation previous to each site 117) of compensating for a dispersion included in the wavelength multiplexed optical signal having

Art Unit: 2613

propagated in the divisional repeating interval on the terminal apparatus side transmission so that a remaining dispersion amount is within a tolerance set in advance;

a second dispersion compensation step (e.g., note the dispersion compensation after each site 117) of performing a dispersion compensation with an additional compensation (any suitable amount of additional compensation after each site 117) amount to the compensation amount of the first dispersion compensation step for the wavelength multiplexed optical signal.

Tager does not expressly disclose:

an **optical add/drop multiplexing step** of performing an optical add/drop multiplexing for the wavelength multiplexed optical signal for which the dispersion compensation has been performed at the first dispersion compensation step; and

a second dispersion compensation step of performing a dispersion compensation with an additional compensation (notice the additional compensation past the zero line after each 117 site) amount to the compensation amount of the first dispersion compensation step for the wavelength multiplexed optical signal **for which the optical add/drop multiplexing has been performed at the optical add/drop multiplexing step** (emphasis Examiner's).

However, optical add/drop multiplexing between multiple steps of dispersion compensation is known in the art, as exemplified by Kelly (Fig. 2). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to implement such optical add/drop multiplexing in the method of the prior art of record. One of ordinary skill in the art would have been motivated to do this since Kelly adequately speaks into an area of relative silence in Tager. That is, Tager broadly discloses locations for switching (switching site 117) without structural details for such locations. Kelly also discloses locations for switching (Kelly, optical add/drop multiplexers in Fig. 2 provide the capability to switch signals into and out of an optical transmission line) **with** structural details for such locations.

Tager does not expressly disclose:

Art Unit: 2613

the optical add/drop multiplexing step of performing an optical add/drop multiplexing **for each wavelength components of the wavelength multiplexed optical signal** for which the dispersion compensation has been performed at the first dispersion compensation step.

However, performing optical add/drop multiplexing *for each wavelength component* of a wavelength multiplexed optical signal is an extremely common practice in the art, as shown by Ramaswami (Fig. 7.5(a)). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to perform such optical add/drop multiplexing in the method of Tager. One of ordinary skill in the art would have been motivated to do this since it provides some advantages over other means for optical add/drop multiplexing, such as no channel constraints, minimal wavelength planning, and possible lower costs for large drops (Ramaswami, Table 7.1, "Parallel").

Tager does not expressly disclose:

a ratio of the additional compensation amount at the second dispersion compensation step to the sum of the dispersion compensation amounts at the first and second dispersion compensation steps being set so as to gradually increase with the transmission distance between said terminal apparatus for transmission and a corresponding one of said repeating apparatuses.

However, notice that Tager indicates various switching sites 117 located along the propagation path in Fig. 4. At the time the invention was made, it would have been obvious to one of ordinary skill in the art to locate these switching sites 117 where the dispersion is zero. One of ordinary skill in the art would have been motivated to do this since dispersion is recognized as an aspect of deterioration of an optical signal (Tager, paragraph [0005]) that would be removed when its value is zero. With such a configuration, the "first dispersion compensating step" and the "second dispersion compensating step" would correspond to the dispersion compensation before and after, respectively, a zero point along a slope of dispersion compensation.

Next, notice the ratio of this scenario:

$B / (A+B)$, wherein

B = the additional compensation amount at the second dispersion compensation step, and

Art Unit: 2613

$(A+B)$ = the sum of the dispersion compensation amounts at the first and second dispersion compensation steps.

In Fig. 4, $(A+B)$ is the same for each slope of dispersion compensation, i.e., the amount of each slope of dispersion compensation is the same. As the propagation length increases, B gradually varies (in this case, decreases). That is, at each successive site 117, there is a successively decreasing amount of additional dispersion compensation at the second dispersion compensation step after a zero point along each successive slope of dispersion compensation. Thus, as claimed, the ratio is set in the following way:

a ratio $(B/(A+B))$ of the additional compensation amount at the second dispersion compensation step (B) to the sum of the dispersion compensation amounts at the first and second dispersion compensation steps $(A+B)$ being set so as to gradually vary together (successively decreasing) with the transmission distance (as the propagation length increases) between said terminal apparatus for transmission and a corresponding one of said repeating apparatuses.

In other way of viewing this claimed *ratio*, notice that it is equivalent to describe this ratio as a gradually varying *percentage* of “the additional compensation amount at the second dispersion compensation step” out of “the sum of the dispersion compensation amounts at the first and second dispersion compensation steps”. In Fig. 4, notice that this *percentage* gradually varies together (in this case, decreases) with the transmission distance.

Tager does not expressly disclose:

said additional compensation amount is a predetermined constant times a total dispersion amount occurred in the divisional repeating intervals on the terminal apparatus side for transmission.

However, analysis of the dispersion map of Tager's Fig. 4 shows that one may describe the dispersion map of Tager's Fig. 4 in the same way. That is, notice the additional compensation past the zero line for each 117 site in Tager. The amount of additional compensation past the zero decreases at a constant rate as there is an increase in total dispersion amount occurred in the divisional repeating intervals on the terminal apparatus side for transmission. One may describe this amount of additional

Art Unit: 2613

compensation with any number of suitable mathematical descriptions. Describing it as “said additional compensation amount is a predetermined constant times a total dispersion amount occurred in the divisional repeating intervals on the terminal apparatus side for transmission” is as suitable as any other mathematical description that adequately captures the amount of additional compensation. This argument is made with the recognition that, even though the prior art of record may lack the same express mathematical description as that disclosed by a claim, the mathematical description *itself* does not present an inventive limitation unless the underlying *subject matter* described by the mathematical description presents an inventive limitation. Since the *subject matter* of the prior art of record is describable by the mathematical description of claim 1, it follows that the mathematical description *itself* of claim 1 does not present an inventive limitation.

Furthermore, Tager does not expressly disclose:

said predetermined constant is from **5 to 20 percent**.

Rather, Tager is relatively silent about the exact value of said predetermined constant. This constant corresponds to the amount of additional dispersion compensation beyond the amount of the first dispersion compensation step, which compensates to the zero dispersion point (the zero points in Applicant's Fig. 3; the zero points in Tager's Fig. 4). However, such an amount of dispersion compensation beyond the amount of the first dispersion compensation step is known in the art, as exemplified by Tanaka (Fig. 7, col. 6, l. 66 – col. 7, l. 19). Tanaka teaches an amount of dispersion compensation beyond the amount of the first dispersion compensation step so that the corresponding constant value would be around 8.6% (col. 7, l. 3-9, DSF accumulates $-1.8 \text{ ps/nm/km} \times 700 \text{ km} = 1260 \text{ ps/nm}$ of dispersion, the compensation amount by DCF is $+18 \text{ ps/nm/km} \times 76 \text{ km} = 1368 \text{ ps/nm}$ of dispersion compensation; additional compensation beyond the zero point is $1368 - 1260 = 108$, and $108/1260 = 8.6\%$). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to implement concepts from Tanaka, such as the exemplary values concerning dispersion accumulation, dispersion compensation, and the ratio/percentages of dispersion accumulation to dispersion compensation. One of ordinary skill in the art would have been motivated to do this since both employ the same basic concept of additional compensation beyond the zero point (notice the similar

Art Unit: 2613

compensation maps shown in Tager's Fig. 4 and Tanaka's Fig. 7), and Tanaka provides details that suitably speak into the silence of Tager.

Tager does not expressly disclose:

a ratio of the additional compensation amount at the second dispersion compensation step to the sum of the dispersion compensation amounts at the first and second dispersion compensation steps being set so as to gradually **increase** with the transmission distance between said terminal apparatus for transmission and a corresponding one of said repeating apparatuses.

Rather, Tager shows a gradual decrease in Fig. 4. That is, there is less "over" compensation as the distance increases. However, it is a known and obvious technique to simply flip dispersion maps. Tager suggests such obviousness by mentioning over-compensation and under-compensation (end of paragraph [0032]). Accordingly, an obvious variation would include a gradual **increase**.

Regarding claim 4, Tager in view of the references applied above (hereinafter the "RAA") discloses:

The wavelength division multiplexing optical repeating transmission method as claimed in claim 1, further comprising a residual dispersion compensation step executed by each of said repeating apparatuses of compensating, where a residual dispersion appears in an optical signal of each wavelength before and after the optical add/drop multiplexing process at the optical add/drop multiplexing step, for the residual dispersion (suggested by adjustable and tunable dispersion compensators of paragraphs [0033-0034]).

Regarding claim 5, Tager in view of the RAA discloses:

The wavelength division multiplexing optical repeating transmission method as claimed in claim 1, further comprising transmission side dispersion compensation step of performing a dispersion compensation (Fig. 4, notice initial dispersion compensation adjacent to 115) which satisfies a transmission condition for a wavelength multiplexed optical signal to be transmitted in said terminal apparatus for transmission (this transmission condition is so broad as to include any number of suitable conditions, such as the amount or sign of dispersion compensation).

Art Unit: 2613

Regarding claim 6, Tager in view of the RAA does not expressly disclose:

The wavelength division multiplexing optical repeating transmission method as claimed in claim 5, wherein the transmission condition relates to at least one of the kind of fiber, the transmission distance and the bit rate.

However, consider the example transmission condition provided in the treatment of claim 5 above: the amount or sign of dispersion compensation. Different kinds of fiber provide different amounts or signs of dispersion, so the transmission condition discussed can obviously be related to at least the kind of fiber.

Regarding claim 7, claim 7 is an apparatus claim that introduces limitations that correspond to the limitations introduced by method claim 1. Therefore, the recited steps in method claim 1 read on the corresponding means in apparatus claim 7.

Regarding claim 10 and 11, Tager in view of the RAA does not expressly disclose the variable dispersion compensation apparatus of claim 10 and the dispersion slope compensation device of claim 11. However, both types of apparatuses are commonly known in the art. At the time the invention was made, it would have been obvious to one of ordinary skill in the art to provide an obvious variation of the apparatus of Tager in view of the RAA by implementing these types of apparatuses. One of ordinary skill in the art would have been motivated to do this since they are generally known to provide additional flexibility and precision in compensating dispersion.

Regarding claim 12, claim 12 is an apparatus claim that introduces limitations that correspond to the limitations introduced by method claim 4. Therefore, the recited steps in method claim 4 read on the corresponding means in apparatus claim 12.

Regarding claim 13, claim 13 is an apparatus claim that introduces limitations that correspond to the limitations introduced by method claim 1. Therefore, the recited steps in method claim 1 read on the corresponding means in apparatus claim 13.

Response to Arguments

4. Applicant's arguments filed on 16 September 2008 have been considered but are moot in view of the new ground(s) of rejection. In particular, Applicant emphasized the new limitation of "said additional

Art Unit: 2613

compensation amount is from 5 to 20 percent of a total dispersion amount occurred in the division repeating intervals on the terminal apparatus side for transmission" (REMARKS, p. 6, middle paragraph, emphasis Applicant's). Notice the application of teachings from Tanaka to address this new limitation.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID S. KIM whose telephone number is (571)272-3033. The examiner can normally be reached on Mon.-Fri. 9 AM to 5 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth N. Vanderpuye can be reached on 571-272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2613

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. S. K./
Examiner, Art Unit 2613

/Kenneth N Vanderpuye/
Supervisory Patent Examiner, Art Unit 2613